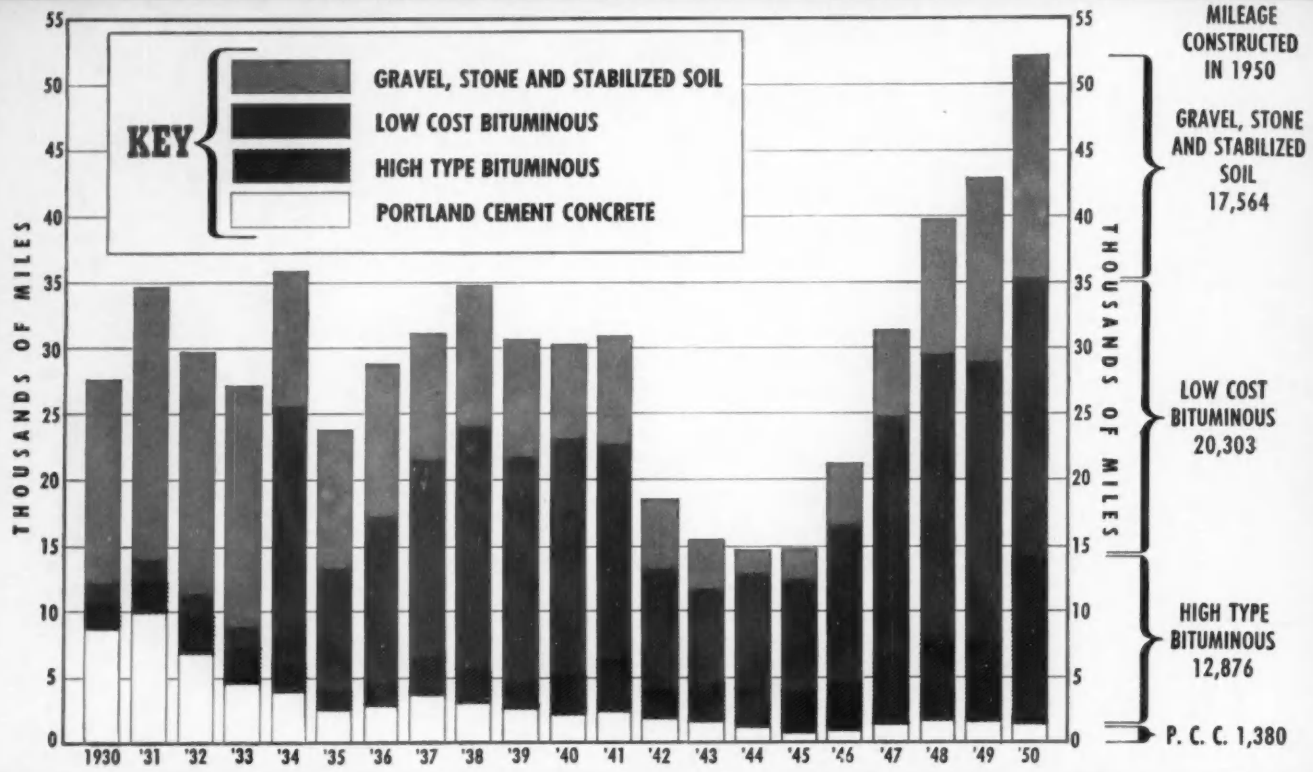
Asphalt Institute Quarterly

ANNUAL MILEAGE BUILT ON STATE ROAD SYSTEMS



SURFACED ROADS BUILT BY STATE HIGHWAY DEPARTMENTS*

(U. S. Bureau of Public Roads' figures)

Year	Portland Cement Concrete†	High Type Bituminous	Low Cost Bituminous	Gravel, Stone and Stabilized Soil	Total
1930	8,814	1,973	1,371	15,306	27,464
1931	9,825	2,688	1,453	20,573	34,539
1932	7,067	2,942	1,342	18,226	29,577
1933	4,797	2,615	1,565	18,236	27,213
1934	3,790	2,596	19,091	10,336	35,813
1935	2,350	1,456	9,312	10,412	23,530
1936	2,610	2,096	12,678	11,529	28,913
1937	3,717	2,815	14,231	6,354	31,175
1938	3,147	2,721	18,447	10,469	34,784
1939	2,476	2,691	16,691	8,926	30,784
1940	1,985	3,335	17,934	7,133	30,387
1941	2,235	4,204	16,564	8,035	31,038
1942	1,471	2,855	8,700	5,335	18,361
1943	1,155	3,495	7,121	3,661	15,432
1944	668	3,444	8,699	1,919	14,730
1945	455	3,598	8,655	2,287	14,995
1946	781	4,180	11,956	4,356	21,273
1947	1,258	5,133	18,079	7,057	31,527
1948	1,588	6,443	21,301	10,619	39,951
1949	1,575	6,204	21,192	13,876	42,847
1950	1,380	12,876	20,303	17,564	52,123

*Includes mileage built by state highway departments on county, local, and city roads and streets not under state control in a few states, and on forest, park, and institutional roads.

†Includes negligible amounts of other high-type surfaces.

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The names of the Member Companies of the Institute, who have made possible the publication of this magazine, are listed herein on page 15.

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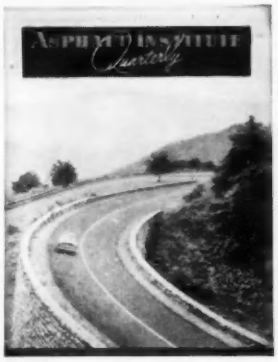


COVER

U. S. Bureau of Public Roads' photo shows North Carolina's Blue Ridge Parkway, State Route 80, at the Buck Creek Gap Overpass. It is near Mount Mitchell (altitude 6,700 feet), the highest peak of the Appalachian Mountains in the State's western region. This parkway is surfaced with two inches of asphalt plant-mix over a primed six to eight inch rock base.

This chart, in presenting *annual* mileage construction figures, shows in graphic form the steady and substantial growth of bituminous totals, particularly in the higher types. As shown, they supplement the *cumulative* totals charted in the April 1952 issue on page 2.

EDITORIAL

A new, great impetus to road building is now being given, and the next two decades will witness construction and reconstruction on a huge scale. This will be the second such period in modern times. In the twenties the slogan was to "get out of the mud". Those who were driving cars during the teens and early twenties well can remember when one literally drove *through* roads rather than over them. It was not at all uncommon, when reaching a particularly wet and sodden section, to stop and survey the scene almost as a scout in advance of an army. The enemy was a bewildering number of ruts, often filled with water, and the decision required was: which pair of tracks to follow so that one would reach firm ground again without bogging down. In some extreme situations it was not unusual to find a teamster waiting at the roadside with a pair of horses to pull out the motorist when he became unable to move farther under his own power. Usually, however, he was not so fortunate and a long walk to find the team was more often the case. Whenever we become overly critical of present road conditions, it is perhaps well to remember that the first great road-building period did end with the objective gained of "getting out of the mud".

Now we have a second objective. With the passage of years, motor vehicles have so increased in number, size and weight, that a previously satisfactory road system has become again inadequate. World War II was responsible largely for this situation, both in deferment of the normal improvements which otherwise would have been accomplished, and in the build-up of demand for new cars and trucks as soon as the war ended. We are again bogged down on the highways which, although hard-surfaced to the extent of nearly a million miles, are so insufficient in respect to width and often alignment, that once again there is need for choice of routes to avoid sinking, not in the rutted earth but into the congestion of other motor vehicles. The slogan "Out of the Muddle", as contrasted with the one thirty years ago of "Out of the Mud" is the present challenge.

Usually there is required a considerable period of inconvenience, even of serious hazard, before people will unite in the common interest to remedy an unsatisfactory situation. For several years both industry and the individual motorist have complained about the matter, yet without doing anything very definite to provide the remedy. In a time when taxation is at the highest level in our history, no one is anxious to assume any burden that can be avoided. Modern roads cost money — a great deal of money — and it must be well understood that "to get out of the muddle" there will be required the expenditure of billions of dollars.

Who is to pay and how much? In recognition of the need for concerted effort to answer these questions, there has been accomplished recently a pooling of effort by both the building and user groups under the title of PAR — Project Adequate Roads. This movement in the coming months will obtain considerable momentum and, as public support is again obtained, in just the same way as took place in the twenties, the important consideration will be to see that the money is expended wisely, so that maximum efficiency will be secured with a minimum of taxation. While some super-highways must be built, even more important is a sound salvage procedure, whereby the roads we already have are utilized to the fullest possible extent. This means rehabilitation in most instances rather than replacement. The current issue of the Quarterly presents some aspects of the problems to be solved.

Truck traffic detour under restricted Pulaski Skyway, between New Jersey's Route 25 and New York's Holland Tunnel.

JOHN LOUDON McADAM

"What Neither John Loudon McAdam nor Sir Isaac Newton Knew About Road Building Present-day Soils Experts do Know"

By Bernard E. Gray

SIR ISAAC NEWTON

During the past few years there has been increasing interest in the design for heavy-duty roads, because *large trucks* require them, both for efficiency and their ability to carry increased loads. Many assertions have been made charging that these trucks are the principal cause of highway deterioration, while others maintain that, if the highways were properly built, the so-called failures under heavy loading would not occur. The Maryland Road Test No. 1 was carried on to ascertain, if possible, some facts in this regard. Other tests roads are planned for the future, with the one at Malad City, Idaho, being built during the current year.

The operators of heavy motor vehicles naturally have a great stake in the outcome of these tests, because the highway designs of the future will reflect the findings, and charges to the highway user will be made accordingly. Several magazines have commented on this situation in some detail, and one in particular ran some quite challenging articles during the past year which deserve further analysis.

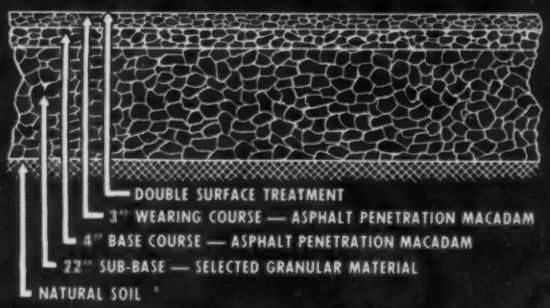
These very interesting reports appeared in "Fleet Owner" during 1951 in May and October respectively, and cited the two persons named in the above title of this article with respect to their discoveries as related to modern road building. It is true that McAdam did improve upon the method of placing stone pavements, but his true claim to fame perhaps is to be found in the establishment of the first really organized highway department; while it is to be noted that the work of Newton goes somewhat beyond the mere manner of load distribution over any kind of surface. In fact it is doubtful whether either of these gentlemen, distinguished though they were, ever fully contemplated the basic problem which confronts the present-day road builder and road user.

The problem now is how can a network of streets and highways, whose needed improvement so unfortunately was deferred during the previous decade, be so rapidly and efficiently modernized as to be adequate for the more than fifty million motor vehicles that are now using them? Work that should have been spread over a period of years must now be accomplished much more quickly and at a time when rising taxation and material shortages are serious handicaps. The manner of solving this complicated problem will affect profoundly not only the pocketbook, and the very security of all road-users, of which group the trucking industry is such an important part, but everyone else as well.

CONFLICTING SOLUTIONS

There are differences of opinion as to how this improvement should be made. One truck operator remarked after reading the first "Fleet Owner" article, which dealt with macadam pavement, that such procedure seemed to be the complete answer, but after reading the second article which dealt favorably with the "concrete" pavement, he stated, "I am now more confused than ever." Without doubt the great majority of laymen are in the same situation. However certain basic considerations are apparent. John Lawrence, Managing Director of the American Trucking Associations, in his article in the December issue of "Fleet Owner," entitled "Black Top or Concrete," correctly stated the proper public attitude on pavement types when he wrote, "We look upon the purchase of highways no differently than we do the purchase of a new truck or a tire. We want highways that will do the job that has to be done and we want to get them as cheaply as possible."

Now, no matter how much promotional effort may be expended by the different material interests engaged in the


DOUBLE SURFACE TREATMENT
3" WEARING COURSE — ASPHALT PENETRATION MACADAM
4" BASE COURSE — ASPHALT PENETRATION MACADAM
22" SUB-BASE — SELECTED GRANULAR MATERIAL
NATURAL SOIL

Typical Pavement Cross-Section — New Hampshire Toll Road.

building of highways, this attitude in the final analysis will be the determining factor. Consequently in the claims and counter claims that are made by the principal suppliers for surfacing highways, it is essential to appraise all the factors which bear upon the matter. This article will deal with some of them.

BEARING VALUE OF SOILS

First, as to manner of load distribution: at the 1951 Annual Meeting of the American Trucking Associations at Chicago, Messrs. Sheets and Kennedy of the Portland Cement Association, presented a paper dealing with the highway program, as they viewed it, and therein outlined some of the needs in respect to different kinds of roads required. They made one statement with which no one can disagree, and it is quoted as follows: "In the last analysis the weight of the vehicle must be supported by the underlying soil. The pavement must be able to spread the vehicle load over a sufficiently large area of the soil to reduce the pressure to an amount that the soil can withstand. It is important to note that the soil can withstand the least pressure during periods when the moisture content is at its maximum. Unless the pavement is designed to meet this requirement, it will fail."

Now the designers of the asphalt type of pavement fully agree with this statement, and so the entire difference of opinion revolves about the question, what is the method which will *most* efficiently provide this load distributing layer so that the soil beneath will not be disturbed. There are several ways to distribute load, and until recently there was not too much difference in cost. The development of the science of soil mechanics, however, has brought into sharp focus the advantages of one method over another, and it would be difficult to overemphasize its importance in designing heavy-duty highways. Through application of this science it is now possible to so use selected soils and aggregates, *(which often require neither asphalt nor portland cement)*, that a composite pavement structure can be secured at much lower costs than previously was believed possible. Instead of relying entirely upon the surface pavement itself to distribute the load, with quite thick ones required for weak soils, it is now possible to place an intermediate layer of less costly material under the pavement proper, thereby permitting use of a less expensive surface yet one entirely adequate for all degrees of traffic volume and weight.

The present-day soils expert knows how to measure the bearing value of each kind of soil for all conditions of temperature and moisture so that for any particular location he can predict just what bearing power it will have and what depth of pavement structure will be required in order that this bearing value will not be exceeded. It is of course evident to everyone that some soils have higher bearing power than others, and that some too are less affected by moisture and freezing than others. It naturally follows then that, if the soils present within a roadway are of high support value and do not change in volume when wet or frozen, such a condition should not require as thick a pavement as when the reverse is true. It follows further that, if a subgrade were so constructed that even where most of the soil is of poor quality with only enough to finish out the upper layer with high quality material, the *selective* placement will still be a vast improvement. This procedure is known as "up-grading" the subgrade, and is carried on by so controlling the handling of earthwork that the better soils are placed in the upper portion in a uniform layer, thus preserving their potential good effect from loss by hit-or-miss distribution in an erratic manner.

ADVANTAGE OF HIGH-LINE GRADE

While this selective process would be a great improvement at any roadbed elevation, there is a further development in highway building which makes this controlled subgrade even more practicable from a cost standpoint than formerly was the case, and that is the desirability of con-

Continued on page 6

THE ALL-ASPHALT, COMPETITIVELY-BID NEW JERSEY TURNPIKE. AIR-VIEW AT WOODBRIDGE, SHOWING SIX TRAFFIC LANES AND ADJACENT SERVICE AREAS. TURNPIKE TRAFFIC COUNT FOR 5-DAY FOURTH OF JULY 1952 WEEKEND 349,642. RATE OF USE IS NOW NEARLY 2½ TIMES AND REVENUE NEARLY 2¼ TIMES PRELIMINARY ESTIMATES.

Photo: Ostergaard

structing the so-called "high-line" grade rather than merely balancing earthwork in the usual cut-and-fill operations. While the latter method resulted in a minimum yardage of earth moved, it usually produced a roadbed that was at such low level in respect to the land on either side that often it became water-soaked. Motorists only need to observe the older roads to know that this is all too frequently the case, as every driver has experienced the constant shower of spray when travelling such locations in rainy weather.

Modern design, then requires that the right kind of a roadbed shall be constructed as an embankment, with the pavement elevation several feet above the ditches on either side. Such a cross-section has so many advantages that they far outweigh the additional earthwork involved, and it should be employed regardless of the kind of pavement. The reasons are apparent. First, the subgrade naturally is kept in a drier state at all seasons. Second, run-off of surface moisture is rapid and the hazardous splash from preceding vehicles is much reduced. Third, snow removal is greatly facilitated, in fact the "high-line" grade frequently remains snow-free simply from wind action, which of course reduces the maintenance cost for this item. It would be difficult to overemphasize these advantages either from a safety angle or from a maintenance standpoint. One eminent engineer has rather concisely summed up the matter by saying that the most important factors establishing the profile height of a roadbed are without regard to the pavement type, and that in general they require an elevation such that a maximum of but eighteen inches is needed for the pavement proper, including base course.

INCREASED ATTENTION TO SUB-BASE

That a quality subgrade has marked influence on any type pavement behaviour is to be noted in various current reports. For one instance take the comment on The Maryland Road Test which was over a "concrete" pavement. On page 43 of the 1951 Annual Report of the U. S. Bureau of Public Roads, Item 2, it is concluded, "There is found to be a definite correlation between soil type and pavement behavior. The higher the granular content and the lower the plasticity of the soil, the better the performance." For another, note in the September-October 1951 issue of "The Military Engineer," an article on "Jet Air-Base Construction," by Lieutenant Commander C. W. Lindgren. Referring to the present trend in making the better subgrades, he writes: "The New Jersey Turnpike is an example of how to prepare sub-bases for modern road and airfield surfaces. The old method of scratching the ground and then trying to make concrete strong enough to bridge future settlements is obsolete. For modern highways and jet-plane runways, no less than 20 inches of scientifically stabilized sub-base should be provided. Then the surface will hold together, regardless of its makeup, whether of concrete or asphalt."

It follows of course that in most cases borrow material will be required to construct this continuous embankment, as ordinary cuts seldom provide sufficient material for the purpose. That being the case, why not borrow the best quality soil available, because the haul conditions usually will be no different than those found in handling poor quality material. Sometimes the cuts will contain high grade soils, in which case the borrow can be obtained in large part immediately adjacent to the road. Usually, however, the material will be obtained from sources at convenient locations nearby, which have been pre-evaluated by the soils-expert for quality.

RELATIVE COST ADVANTAGES

At this point the question naturally will occur to the reader, how much does this improved subgrade cost? Moreover, inasmuch as so many independent engineers agree upon its merit, why is there any question about its use, even on the part of those promoting different kinds of pavement? The answer is simple — relative cost advantage. In highway construction, as in so many other segments of American industry, competition between materials and methods has been a constant stimulus in bringing out new methods and new machinery. It is the very basis of American enterprise. At present, out of all the many paving materials that have been tried, two are now of principal importance, portland cement and asphalt. However, competition between these products goes very much beyond the mere difference in material qualities. Different engineering philosophies are

involved. In the one, portland cement concrete represents the rigid type of pavement which acts like a beam. In contrast, asphalt is employed in a flexible design where the pavement *must react* with the foundation, so that if the foundation is strong the composite structure will be strong.

FACTORS FAVORING ASPHALT

Now it is perfectly possible to build either asphalt or portland cement concrete pavements which will carry any desired loads. No responsible engineer disputes this statement, the whole argument being over the matter of cost and certain variations in characteristics. As the latter can be modified in either type to meet desired standards such as color and texture, the question of cost, including both construction and maintenance, becomes the real criterion in selecting one type over the other. While twenty years ago, (and even as recently as ten years in some areas), portland cement concrete was less expensive to build than asphalt for the heavy-duty pavements of those times, today the situation is being rapidly reversed, hence the intensified competion witnessed on every side. At the outset the advocates of asphalt endeavored to obtain an advantage in the building of heavy-duty pavements through improved asphalt machinery, whereby the lowered costs would enable them to compete successfully on an inch-for-inch basis.

This today is an established advantage, the cost of a cubic yard of asphalt pavement being usually a little less than portland cement, but in the meantime the development of the science of soil mechanics has made it increasingly economical to provide a large part of the needed load support through improving the soil subgrade. Such a subgrade, plus a base course of stone, gravel or other selected materials, thoroughly compacted by new mechanical methods, and then protected with a relatively thin asphalt surface, produces a pavement structure that is in durability equal to any previously developed and at the same time is much lower in cost than either an all asphalt or all portland cement design. It just so happens that a flexible design makes greater use of improved subgrades than is the case with the more rigid pavements. Hence the thickness of the asphalt surface can be reduced more nearly in proportion to the improvement of the subgrade, and consequently, under present day conditions, for a given load condition, it is nearly always possible to construct the asphalt surface at the minimum cost.

Now naturally, competitive interests will not give up their former preferential position without a very hard fight. This attitude is all to the good, because it puts all elements in the paving industry on their mettle to improve products and to lower costs. It is for this reason that, particularly on these large projects like the toll Turnpikes, it is advantageous to provide alternate designs on which to receive bids. This produces competition not only between contractors but also between materials and equipment. Possibly the pendulum will swing again and advantages lost will be regained by reason of further development. However, all competition should be on the basis of load carrying ability and, if for example these better subgrades and inexpensive base courses will provide the needed support, the surface itself should be made only just thick enough to provide needed waterproofing and resistance to abrasion, and no more.

EMBANKMENT COSTS FOR NEW JERSEY TURNPIKE

It has been claimed that the embankment on the New Jersey Turnpike cost more for the asphalt type pavement than would have been necessary had "concrete" been employed. In the October 1951 issue of "Fleet Owner" a chart was presented on page 44 which represents the upper 18 inches of the subgrade as a "base course," with the notation that it would not be needed for a "concrete" pavement. See Fig. 1. As this statement questions the true competition between alternate designs it merits reply. Inasmuch as some kind of soil had to be there to fulfill the requirements of the roadbed level, it should be evident that this layer could not be omitted, and the only question then is did the selected

Continued on page 8

Memo: Are these sections Truly comparable?

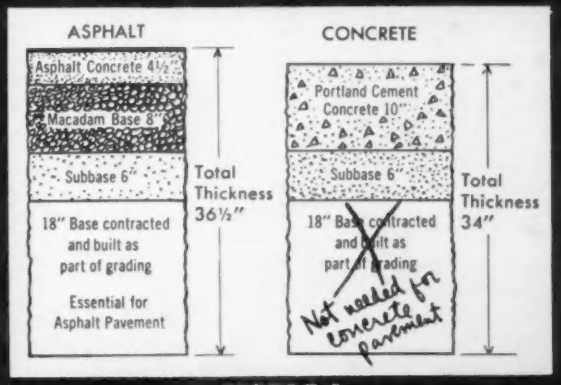


FIGURE 1

VIRGINIA, Route 11, two miles north of Natural Bridge. Cross-section: Asphalt surface treatment, over 8" waterbound macadam in 1934, 1" asphalt plant-mix wearing course added in 1938; 1½" asphalt plant mix added in 1944. Thus kept adequate for traffic at minimum cost. *Photo: Dent*

MARYLAND. Route 170 Friendship Airp
section: 3" asphaltic concrete wearing
penetration macadam base, upon 8" w
over 2" screenings foundation.

soil cost more than ordinary hit-or-miss excavation? Of course on this project, for a considerable distance the entire fill was of pumped-in sandy material because it was the easiest to obtain. Obviously in these locations it made no difference, but in others there may be some lingering doubt on the subject, so further analysis is required. In northern climates a certain depth of non-frost heaving subgrade is needed regardless of pavement type, a fact obvious to all. But suppose even this factor is eliminated, just what are the extra costs for the selected material?

The January 1952 issue of "Civil Engineering" contains an article by J. D. Welch, Soils Engineer for one of the consulting engineers on the project, which gives figures on the item. In the earth-moving operations there were over 16,900,000 cubic yards of roadway excavation, 2,960,800 cubic yards of muck excavation, and 22,460,000 cubic yards of borrow. As pointed out by Welch, the source of the select subgrade materials was from both roadway and borrow excavations, and they were handled generally in the same manner as common embankment except that compaction to 95% of maximum density was required. Costs were as follows: Roadway excavation averaged 39.7c per cubic yard, borrow excavation 56.5c per cubic yard, a difference of 16.8c. Much of the selected subgrade came from roadway excavation, as noted, but assuming it all came from borrow, this extra cost amounts to only 8.4c per square yard for that 18 inch thickness, which looks so big on a chart, but which actually is so important in the life of the roadbed that it would be the height of folly not to have it.

ECONOMY OF SELECTED SOIL

This same kind of criticism was directed against the design of the Oklahoma Turnpike, but here too the actual costs are available, and have been very carefully analyzed to determine how much more, if any, the selected soil subgrade cost. It was found on this project to be *actually cheaper* to build the upper layer of the subgrade with selected material, and yet which would so increase the supporting power that a relatively thin flexible type base and surface would be more than adequate to carry all anticipated loads. The Oklahoma Turnpike is designed for 28,800-pound axle loads (including impact allowance) and, while not as high as that to be permitted in New Jersey, is nevertheless much higher than present state highway standards.

At first glance this lower cost may seem incredible. However, one need not be an engineer to understand that, where earthwork is balanced by taking only material excavated from cuts and placing it in the fills, there inescapably will be a wide variation in its character. In many instances there will be rock, or shale, or heavy clay. If this variable material is simply dumped in a haphazard fashion, considerable difficulty will be experienced in making it level and bringing it to the thoroughly compacted condition which is demanded by present engineering standards. In contrast, by using a selected soil material for the upper portion of the subgrade, (usually obtained from some borrow pit within easy hauling distance), these spreading and compacting operations are much simplified, because obtaining the required density takes less labor and less use of equipment.

FUTURE MAINTENANCE COSTS

Finally a word in regard to the maintenance costs in the future. Statistics in this regard should be analyzed very carefully, because flexible type surfaces include a wide range of construction and maintenance procedures, varying all the way from a simple dust-layer treatment to the heaviest asphalt pavement. As a matter of fact, with each passing year and with the older lighter bituminous roads becoming strengthened through stage improvement, the comparison becomes increasingly favorable to the flexible type pavements. While state highway records in many instances are quite incomplete, still there are a number of very good maintenance reports which cover a long period of time.

Maintenance figures for modern high type pavements of several kinds are perhaps typically represented in Massachusetts and cover a period of many years. Up to 1945 (the latest available figures) it was indicated that a good average value for heavy duty pavements of both flexible and rigid types was about 1c per square yard per year. This is at the rate of $285 per mile per year for a dual highway having a

ndship Airport Overpass. Cross-
te wearing course; a 3" asphalt
upon 8" waterbound macadam,
ion. *Photo: Dent*

CAPE COD, MASSACHUSETTS. Route U. S. 6, Mid-Cape Expressway. 2½" asphaltic concrete wearing course; a 4" asphalt penetration macadam base, over 8" gravel sub-base.
Photo: Howard

total pavement width of 48 feet (28,160 square yards). The saving in first cost in favor of heavy duty asphalt pavements, throughout the country ranges from $10,000 to $50,000 per mile. On the New Jersey Turnpike the saving was $46,000 per mile. It thus is clearly evident that, with the average saving in first cost invested in the usual Turnpike bonds, and with maintenance at even higher figures, there could be sufficient income to cover the entire cost of asphalt surface maintenance during the life of the pavement, without necessity of additional appropriation.

IMPROVED MAINTENANCE PROCEDURES

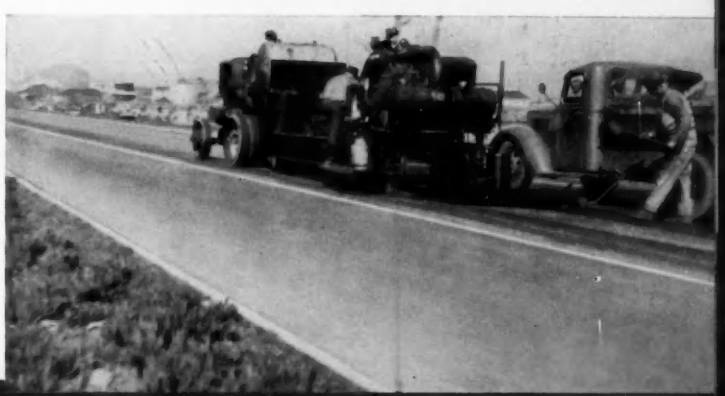
It is important, too, to consider needs in respect not only to costs, but also in regard to maintenance procedures of the future. All pavements require periodic repair to preserve their efficiency, but the methods vary considerably between rigid and flexible types. In the asphalt type there can be periodic restoration of the surface in amount just sufficient to replace wear and maintain the original cross-section and profile. This latter procedure is possible only with bituminous type surfaces, of which asphalt is the most important. Many cities already follow such methods, using special equipment which first heats the surface followed by removing about one-half inch by raking. While still hot a new layer of asphalt-mix is placed and rolled, and becomes completely bonded with the old pavement. Unless there is need to replace sub-surface structures, such renewal procedures can be carried on indefinitely.

Already there are new types of equipment coming on the market to accomplish the same thing but which are adapted particularly for work on *rural* highways. They are the combination heater-planers which move at a fairly rapid rate in the direction of traffic and which both heat and plane-off the surface whenever it becomes rough or worn. Immediately thereafter the new surface is placed by mechanical spreaders (as little as one-half inch can be placed), restoring the pavement to its original condition. The work can be done during hours of minimum traffic, and the new surface requires no curing but can be used immediately after placement. Such work done at intervals of fifteen to twenty years, and only then on areas where necessary, will keep the pavement in first-class condition, not only during the life of the bonds, but far beyond into the future.

USE OF THE SCIENCE OF SOIL MECHANICS

So it seems to this writer that far greater use should be made of this science of soil mechanics than so far has been the case in respect to maximum utility of low-cost foundation materials. Possibly some would like to see an eight or ten-inch asphalt pavement similar to rigid designs, but if the economics of the local situation indicate that the needed strength can be obtained by upgrading the subgrade, and making greater use of aggregate bases, with only four or five inches of asphalt surface, then to continue to design for greater thickness does not make sense. To repeat John Lawrence of the American Trucking Associations, we too look upon the purchase of highways as no different than the purchase of a new truck or a tire, and now with the increased concern on the part of the motor, rubber and petroleum industries relative to adequate highways, it is to be hoped that this same attitude will prevail on every side. There can be no doubt but that the highway engineer will welcome support from the highway user in advocating such sound business practices, to the end of obtaining the most miles of good roads for the least money.

END



The combination heater-planer operates to restore a uniform, smooth-riding surface whenever it has become rough or worn.

PAR-
Project Adequate Roads

MASSACHUSETTS' WORCESTER TURNPIKE near Wellesley. The portland cement concrete pavement was resurfaced in 1948 with 2½" asphaltic concrete in two 1¼" courses. *Photo: Howard*

It was quite evident even before the end of World War II that the streets and highways of America were in need of very substantial rehabilitation and improvement. Since 1945, the increase in use of motor vehicles has far exceeded all forecasts, both on rural highways and in and around urban centers, with resulting further deterioration in both physical and traffic conditions. Inasmuch as our economy is based to such large degree upon highway transport, it is apparent that delay with regard to corrective measures cannot but impede the business operations of the entire country and, further, that continuation of the present inadequate facilities is a threat even to our national security. In a project of this magnitude there are of course divergent views, but they are of method only and not of needs.

THE SCOPE OF THE PROBLEM

For example, as pointed out by Cyrus S. Gentry, Chairman of the American Petroleum Industries Committee, in a recent speech before the Highway Officials of the North Atlantic States:

> "We in the petroleum industry are vitally interested in this great problem of insuring adequate highways to serve motor transportation .....

"Needless to say, none of us think of highway, road and street development as exclusively or even primarily an oil industry problem. It is in the lap of all of us, the automotive and tire industries, truckers, bus owners, the drivers of passenger cars, and numerous other groups not to mention you highway officials who deal with it so directly. But by the same token it cannot be regarded as a problem that highway officials and engineers should be left to wrestle with alone, without help. It is far larger than any individual or group of industries. It is as big and as broad as the United States .....

"Let us assemble all the facts possible. Let us make every study that prudence would dictate. Let us submit it to the people through as many educational campaigns as may be required to apprise them of all the relevant factors. The people will then pass their judgment. They may support our views. They may adopt the conclusions of someone else. The important thing is that the discussion be adequate, sincere and to the extent possible without passion. If that be done and if we believe in democracy, we will be willing to accept the verdict, whether or not it coincides with our own

OHIO. THE FOUR LOW-COST, ASPHALT ROADS, SHOWN BELOW, REPRESENTATIVE OF MANY THOUSANDS OF MILES THROUGHOUT THE UNITED STATES, HAVE BEEN KEPT *ADEQUATE* FOR TRAFFIC, FOR AN

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view. But it requires unremitting studies, constant education of the public and a charitable attitude toward those with whom we differ . . . . . .

"All of us use and help pay for these roads. The challenge today is to all of us. Can we, working together, in spite of our differing viewpoints, solve it? My answer is — yes, if we use the democratic process."

A COOPERATIVE SOLUTION

Now, that democratic process is being advanced under **PAR** — *Project Adequate Roads,* a movement directed by an informal National Committee composed of principals from the automotive, petroleum, rubber and construction industries, the various farm organizations, as well as the highway-user groups, including both large and small units.

The movement was definitely organized on February 28, 1952, when officials of some forty organizations representing a large cross-section of the Nation's economy, met in New York to discuss ways and means of achieving the objective — *Adequate Roads.* Additional groups are invited to join to the end that the most complete unity of effort may be secured.

Once before such a cooperative effort was made, when in the twenties something was really done to get America "out of the mud." Meetings were held all over the land, and at every principal assembly of various organizations, whether a State Chamber of Commerce or a County Teachers Institute, time was reserved for a speaker to tell about the need for improved roads. Once the public had been educated to the need, it was not long before a nation-wide network of all-weather roads came into being, and we were "out of the mud" at least on our main highways. Today, however, over a large portion of this network we find that many of these roads are not wide enough, not straight enough and in places are too steep for modern traffic. This condition makes for congestion, so the problem now is "to get out of the muddle", and the same kind of program that was successful in the twenties will be equally successful today if the public is correctly informed as to the needs.

THE FUNCTIONS OF PAR

Following the organization meeting of February, a second meeting of the National Committee for **PAR** was held in Washington on May 6, 1952. As stated in the recent booklet **PAR:** *Project Adequate Roads — What it is and What it does,* "the functions of this Committee are to:

(a) stimulate efforts for highway improvement
(b) act as a clearing house to make available wherever possible engineering, legislative and other pertinent data; and
(c) provide information to the public primarily through the use of the advertising and public relations departments of participating groups.

It does not take the place of existing organizations nor does it assume any of their rights and privileges."

This booklet was prepared under the auspices of the National Par Committee, and copies may be secured by writing to: Arthur C. Butler, Secretary, 952 National Press Building, Washington 4, D. C.

Perhaps of particular interest at the moment are the tentative reports of the several committees which reported to the Fourth Highway Transportation Congress also held in May of this year and which reviewed particular phases of highway development as related to both present and future needs. While everyone may not agree with all of the recommendations, nevertheless the objective analysis is the sound approach. Some of the topics covered were as follows:

Shortage of Highway Engineers
Improved Highway Administration
Classification of Roads into Systems According to Traffic Service
Funds for Adequate Highway Systems
Fair Distribution of Cost among all Highway Beneficiaries
Protection of Highway Funds, to Assure Use for Highway Purposes
Highway Safety
Defense Mobilization
Reciprocity between States, Elimination of Highway barriers
Uniform Motor Vehicle Laws
State Conferences on Adequate Roads
Economic Effect of Expressways
City Freeways and By-passes
Values to be Developed from Road Tests
Place of Third Lanes for Slow Moving Vehicles on Steep Grades
Toll Roads

Continued on page 12

AVERAGE OF OVER 35 YEARS EACH, AT *MINIMUM* COST. THEIR LOAD-BEARING VALUES FOR FUTURE IMPROVEMENTS HAVE STEADILY IMPROVED AND ALL FOUR ARE IN EXCELLENT CONDITION TODAY.

Photos: Gosborn

STATE ROUTE 13, ATHENS COUNTY. Asphalt surface treated, 20 feet wide. In 1921, surface was sandclay-bound macadam, 17 feet wide.

STATE ROUTE 32, CHAMPAIGN COUNTY. Asphalt surface treated, 20 feet wide. In 1916, was sandclay-bound stone, 16 feet wide.

VIRGINIA. ROUTE 50, WITH WASHINGTON AND LINCOLN MEMORIALS VISIBLE IN BACKGROUND. CROSS-SECTION: 2" ASPHALTIC CONCRETE WEARING SURFACE; 3" HOT-MIX ASPHALT BLACK BASE, OVER 12" GRAVEL SUB-BASE.
Photo: Dent

SHORTAGE OF HIGHWAY ENGINEERS

The list clearly indicates the magnitude of the problem. In the opinion of this editor, one of the very first requirements is overcoming the shortage of Highway Engineers, in order not only to carry on properly the actual construction and reconstruction plans as finally adopted, but even to make an accurate, detailed appraisal of needs. While at first view, especially to the dweller in urban areas, the entire road system may appear deficient, actually this is not the case, as many thousands of miles of highways are now reasonably satisfactory and can be made entirely so with relatively small further expenditure. However, as such appraisal requires good engineering, one of the most needed present adjustments is to place public service on such a plane in public esteem as will attract the most capable personnel.

Highways are big business, and the annual expenditure of billions of dollars requires the highest quality of engineering brains if full value is to be obtained. Anyone familiar with the present situation knows that the men who made the highway departments during the past thirty years are now rapidly reaching retirement age, and that there has been great difficulty in recruiting a sufficient number of able younger men to take their place. To correct this situation, salary and retirement benefits must be made comparable to those paid by private business for similar positions in respect to skill and responsibility. Moreover there must be assurance of continuous employment without political interference, together with opportunity for advancement on merit.

Improved highway administration requires not only skilled engineering, but also appropriate legislation to permit full latitude for such operations. Many statutes are a carry-over from the "horse and buggy days" of transportation. No one is particularly to blame, because this flood of traffic has come upon us while the nation was engaged with other problems. Now, however, with combined support of all highway-user groups it is important to make such necessary changes as will permit the best use of our resources.

IMPACT ON NATIONAL PROGRESS

The other studies and researches are those incidental to a proper solution of the matter. Let it be remembered, as the Committee on Defense Mobilization noted; "Highway transportation is not just motor vehicles, nor just highways. It is both — and it is much more. It is a system of motor transportation without which our present national progress would have been impossible. The network includes busses, passenger cars, trucks and truck trailers; rural roads, city streets and trunk highways. It includes the companies that supply or service these, or which depend on highways in their daily business. It is an interdependent grouping. What is good for one part of the system is good for all. What is bad for one part is bad for all — and for the nation."

CONCLUSION

This brief review will give some idea as to the broad scope of this **PAR** undertaking. It is evident that a very complete appraisal of needs is of first importance, and that to accomplish this objective there must be cooperation between all highway-builder and highway-user groups. On the basis of studies already made it is also apparent that the answer to highway deficiencies is not to be found solely in the building of new express highways in multiple lanes. There is neither material nor personnel to bring this about, nor is there need for such development. Probably less than one per cent of the total highway mileage will require such treatment. Wherever possible, traffic should be dispersed rather than concentrated. This means improvement of existing roads to a more uniform standard so that traffic has a choice of several alternate routes through an area. Intelligent use of the "Sufficiency Rating Index" will be of great value in this regard. Removing bottlenecks, such as correcting sharp curves, building third lanes on steep grades, and above all widening and resurfacing to increase load support and achieve lateral mobility will go a long way to early attainment of the goal of getting out of the present traffic "muddle."

On the other hand, where existing roadways are clearly inadequate, as in and adjacent to the metropolitan areas, or where for topographical reasons a single location is more economical, the bold concept of providing wide freeways, even at the cost of hundreds of millions of dollars, is the only sensible procedure. Sound planning based upon careful, competent engineering and fiscal studies should be applied to each particular situation in just the same manner as for any private industrial expansion. The method of financing is secondary to determination of the basic soundness of the improvement, and which may be judged by the volume and kind of traffic which will use the facility. Application of sound business principles in this regard, backed up by our ample mechanical and material resources, cannot fail within the next decade to very largely overcome the present deficiencies in the highway system and place it upon a proper operational basis.

END

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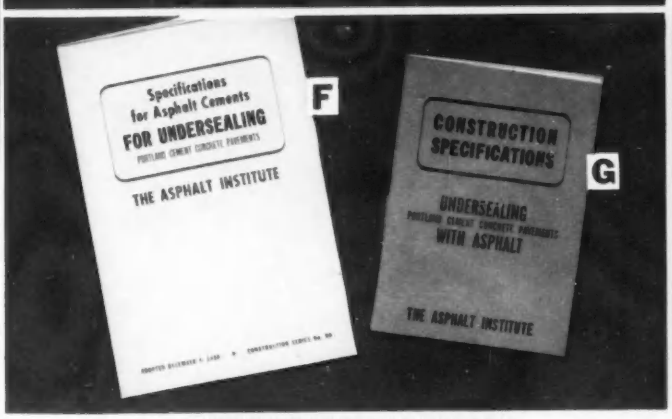

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A graduate of Indiana's Manchester College, with post-graduate work in the Department of Chemistry at Ohio State University, Mr. Goshorn was employed by the Ohio State Testing and Research Laboratory as Chief Chemist in 1926. After serving there for twenty-five years, latterly as Assistant Chief Engineer, and working closely with the Design, Construction, and Maintenance Bureaus of the Ohio Department of Highways, he joined the Engineering Staff of the Asphalt Institute in 1951.

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Educated at George Washington University, and with service in both World Wars, Mr. Ryan holds the rank of Lieutenant Commander in the U. S. Naval Reserve. His highway engineering career includes twenty-two years with the U. S. Bureau of Public Roads, successively in the Bituminous Laboratory, in the Division of Design, and in the Field as Materials Engineer. In 1948, for the City of Oakland, California, he was appointed Materials and Research Engineer, leaving this post in 1951 to join the Asphalt Institute Engineering Staff.

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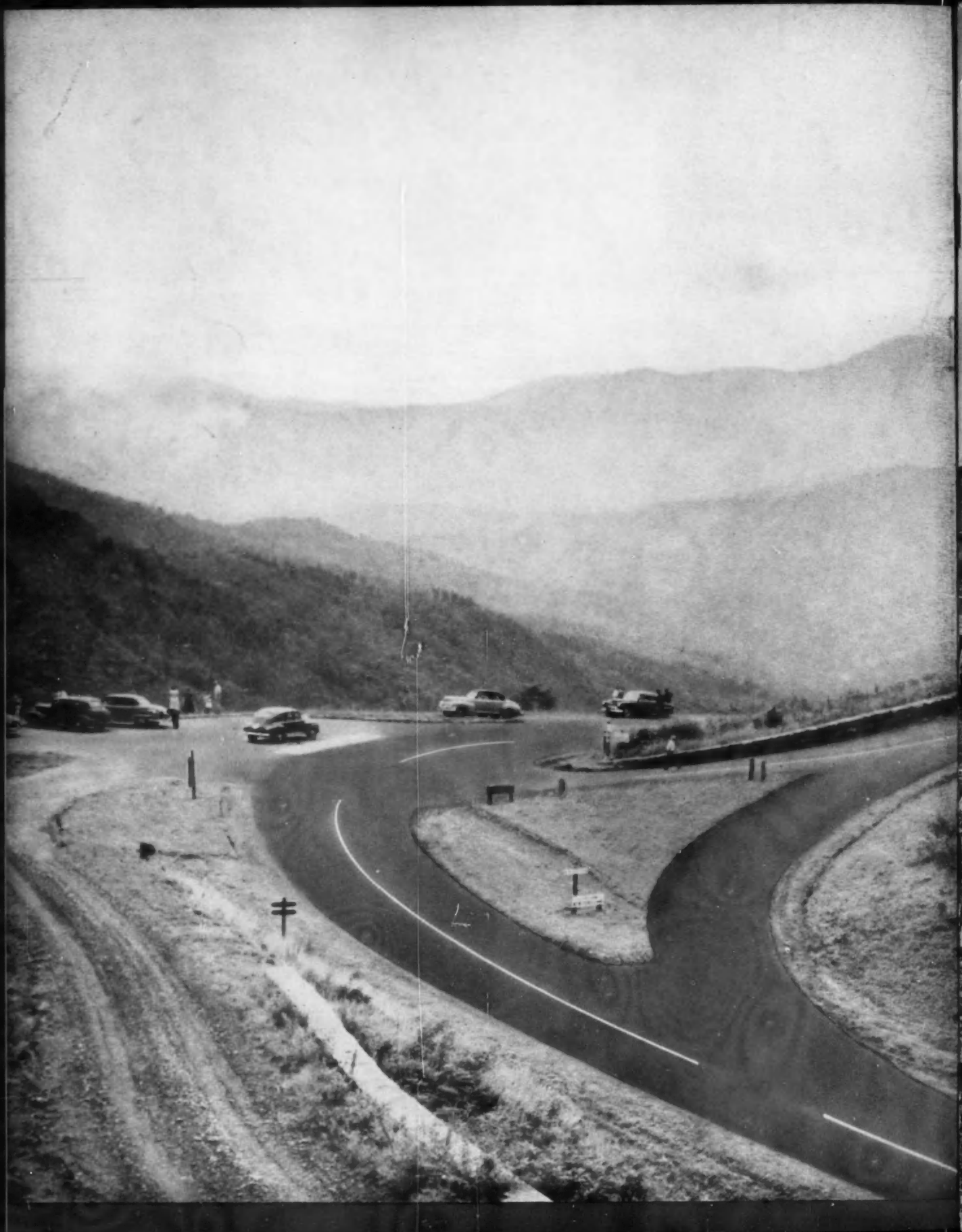
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